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### The Father of the Fear Gauge Says He Feels Reassured by the VIX

Robert Whaley, who built the Cboe's popular volatility index almost 30 years ago, says he still watches it daily.

By Jon Asmundsson

(Bloomberg Markets) -- Robert Whaley spent the last four months of 1992 in a small town near Dijon, France, with a set of large hard drives containing what was then the entire series of index option prices from the Chicago Board Options Exchange. On sabbatical from Duke University, he'd been commissioned by the exchange to create a volatility index. With two powerful PCs, he worked out the formula for the Chicago Board Options Exchange Volatility Index. The VIX was unveiled in Chicago on Jan. 19, 1993.

Now the Valere Blair Potter Professor of Management at Vanderbilt University in Nashville, Whaley connected for an interview via videoconference on April 21, the day after crude oil futures had traded at negative prices for the first time.

**Jon Asmundsson:** In the early '90s, you were teaching finance at Duke and the CBOE hired you as a consultant in some litigation. Then the exchange asked you to create a volatility index. Can you tell me the story of how that came about?

**Robert Whaley:** Sure. The CBOE introduced index options early on—I think it was 1983. At that time they were S&P 100 options. And during the October '87 crash, what had happened was the implied volatility of some put options got to extraordinarily high levels—172%, I think, was the highest one I saw. And there was a class-action suit against the CBOE for sponsoring a market that essentially had these inordinately high levels of volatility. It was eventually settled. The bottom line was I had done some litigation support work for them. In those discussions, the focus was completely on volatility, and the conversation really went toward, "Well, it would really be interesting to have an index on volatility." So that was the seed for moving ahead with a volatility index.



Robert Whaley | Illustration: Jack Hughes

The trouble you have by focusing in on the implied volatility of a single option is that its maturity changes every day. And its relationship with the underlying index level changes every day as it moves around the exercise price of the option. So the key ingredients to developing a sensible index would be to somehow hold the moneyness constant—make it an at-the-money option by interpolating around the [equity] index level. And by using options with different maturities, interpolate to get a constant 30 days to maturity. So that's essentially it. What you do is you devise a formula that takes all of the different implied volatilities for these options, and it creates a single definition that is a 30-day volatility of an at-the-money option. So that's the origin of the VIX.

**JA:** Was the idea that the VIX would track the buying of puts by institutions to hedge portfolios?

**RW:** No. As it turned out, that's the way it is used. In theory, what the index should be doing is giving you an expectation of the future realized volatility over the next 30 days. So it's not telling me the expected range of stock prices tomorrow. It's telling you the expected range of stock prices over the next 30 days. It's sort of an average of the ranges over the next 30 days. People get a little bit confused about it in the sense that they want to tie VIX to how volatile the market is today. That's comparing apples and oranges. VIX is telling you about the average

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volatility over the next 30 days as opposed to what the volatility is today. From a theory standpoint, that's what it should be. But that's not what it turns out to be.

Look at the level of VIX. Suppose I were to design an experiment—and I have done this multiple times—where I take the level of VIX today and then I simply go forward using a history of the daily level of VIX on day  $t$ . I go forward 30 days, and I just compute what the volatility was over the 30 days. And I compare VIX to the future realized volatility that it's predicting. You can think of an Excel spreadsheet where I have VIX in one column and the other column is what the realized volatility was. If I take the average of those two columns, the average of VIX will be about 400 basis points higher than the realized volatility. And that's because people pay a lot of money for portfolio insurance. That is, they buy S&P puts. They pay more than their actuarial value, if you like.

**JA:** That's true generally for options, isn't it? That implied volatility is higher than realized?

**RW:** No. If you look at stock options and do the same experiment—and I have done this in some of my research—implied volatility of stock options is an unbiased predictor of the realized future volatility. This is unique to index options. The index option market is institutionally driven. Stock options are largely retail customers.

"It's as meaningful to me as looking at the level of the dollar or the SPX, because it's telling me how anxious people are about the next 30 days."

**JA:** How do you feel about the VIX's popularity?

**RW:** I'm quite happy. I follow that number each and every day. I mean, it's as meaningful to me as looking at the level of the dollar or the SPX, because it's telling me how anxious people are about the next 30 days. But I also view VIX in conjunction with the VIX futures prices. And so you see the level of VIX today—47 now. If you go to the one-month futures contract on VIX, you'll see it's probably around 42. And the two-month contract, I can look it up, I have this Bloomberg machine in front of me.

**JA:** Yeah, me, too. The May 20th is 42.

**RW:** I'm going to pay 47 for my insurance policy today. But if I go out 30 days, for the same 30-day policy, I'm going to pay 42.

So what does that tell me? That tells me I'm really anxious over the next 30 days, but I'm anticipating there's going to be a lot of resolution of the uncertainty when 30 days is up. And you can see, as you go along the curve iteratively, you can do that with each interpretation. And I think it's downward sloping.

**JA:** I'm going to shift over toward leveraged and inverse exchange-traded products. Years ago you calculated that investors at that point had lost some \$4 billion on VIX products. Is that something you've continued to track?

**RW:** Absolutely. I don't have a new estimate, but all you have to do there on your Bloomberg machine is type in the symbol SPVXSP. That index began reporting on Dec. 20, 2005. At that time, the level of that index was 100,000. And what is it today? 67.

**JA:** Yeah. So the total return is -99.93%.

**RW:** Ha. That's what VXX [iPath Series B S&P 500 VIX Short-Term Futures ETN] provides you. So if you buy and hold that over that period, that would be your generous rate of return. And this happens because these things are



From the June/July issue of Bloomberg Markets. Illustration: Lauren Tamaki for Bloomberg Markets

essentially futures indexes. They're not VIX. And generally what you see is futures prices being higher than they should be. The futures price is usually an upward-sloping price curve. And what happens through time is that the futures prices move down toward the spot price, and you lose money.

XIV [VelocityShares Daily Inverse VIX Short-Term ETN] was the opposite of it. I don't know if you remember XIV?

**JA:** I was going to ask you about that.

**RW:** Yeah, it was a  $-1x$ . That was a more sensible product. The interesting part of that one is that it was institutions that were buying this thing—some important institutions that really shouldn't be dabbling in futures markets. But because these things trade on securities markets, they can. They can short things when they're precluded from shorting. If you go to 2017, what you saw during the year was XIV was a money machine. It was because there was no volatility in the stock market. They were continuing to essentially earn

this contango gain that VXX is giving up every day. And then what happened was there was one event. Given the distribution of that VIX futures index, the probability of a 100% event was not a zero, and they observed a 100% event where the VIX spiked up on Feb. 5. And if it spikes up by 100% and you're promising  $-1x$  that, you're in a little trouble. You can't deliver.

Right now, it's not really volatility that's getting the limelight, it's really crude oil. But the same set of problems are there, same sort of problems are in natural gas. And what you saw [in March] is one of the big fund families had a  $-3x$  and  $3x$  on crude. They liquidated both of those funds. It turns out to be a reasonable move—they would have really been in trouble moving forward. But right now they still have  $-2x$  funds, and I wouldn't be surprised if something happens on that front.

"It's no different than going to a casino in Las Vegas. You're making a short-term bet on something, and you happened to be lucky."

**JA:** So you're not a fan of leveraged or inverse ETPs. What's the main thing that's wrong with them?

**RW:** By trading these things, you're allowing people who can't get into the futures market access to strategies they shouldn't have in the first place. All of the restrictions on the futures market were put there for a purpose: to protect the integrity of the markets and avoid the disasters that are currently happening in the leveraged and inverse markets. You're putting things in the hands of people who don't understand them. When people trade these different products, they believe they're trading crude oil, for example. They're trading crude oil futures—they don't know it. These things trade enormously. USO [United States Oil Fund LP] traded 373 million shares today. Is that reasonable? What I mean is, this is a casino.

**JA:** So for leveraged ETPs, how does the daily price path of the index drive the difference between the return investors expect and what the products actually deliver?

**RW:** Well, suppose you decide that you wanted to buy a  $-2X$  ETP. What the  $-2x$  does is it gives you that return times the daily rate of return. So what you do implicitly when you buy one of these things is you rebalance at the end of each day. Then you get  $-2x$  for the next day. So the return I actually get over the month is completely unpredictable. And that value could actually be negative. Is it a good buy-and-hold strategy for an institution? No.

Is it a good and effective hedging vehicle for people who might want to hedge? No. Is it going to lose money over time? Yes.

**JA:** To play devil's advocate, though, year to date as of yesterday, TVIX [VelocityShares Daily 2x VIX Short Term ETN] was the best-performing U.S.-traded ETP, with a return of 410%. Surely there must be someone out there who benefited from owning that this year, right?

**RW:** Yeah, a day trader. But is that who the securities market was intended to serve? It's no different than going to a casino in Las Vegas. You're making a short-term bet on something, and you happened to be lucky. All the more power to you.

**JA:** I understand the argument that the stock market is ideally a way of allocating capital to its best uses. But I'm not sure I personally believe it really works that way. Are we just not getting there because of failures like these products, or what?

**RW:** I don't know if there's a good clean answer to all of this. Traditionally, I knew what the securities markets were there for. I knew what futures markets were there for. And when people were introducing new futures contracts on a new asset class, they always had to make arguments as to why these are socially responsible instruments. And in that defense, what they had to do is make an argument that, "Hey, if I want to have a wheat futures contract, who needs that wheat futures contract? Well, farmers need that wheat futures contract. They have a lot of risk that they face every year when they're seeding their land. They don't know how much harvest they're going to get per acre. They don't know what price they can sell it at. But I can help him manage some of his risk. If I allow him to sell a futures contract on wheat, he could lock in the price at which he could sell at in the fall." That's a social purpose. All of the grain contracts were introduced in that way.

Are there natural bodies of hedgers on each side of the trade that either want to buy the contract or want to sell the contract? Then speculators step in and take up the balance, if you like. If there are more short hedgers, like in the wheat market, more farmers selling than cereal producers wanting to lock in a price at which they acquire the wheat for making breakfast cereal, then speculators will step in. That's the natural state of affairs.

The point is that there are hedgers that need these contracts. OK, let's go over to the securities market now. These people with their new inventions need access to capital. They create securities. When you buy a stock, you're getting an earnings stream. You're buying something productive.

What you see in instruments like these ETNs, you're not buying anything but a futures position. And taking on a role as a speculator. Who's hedging using these instruments? Nobody's hedging. What you've done is you've provided a form for people to take daily wagers on price movements. They're taking flyers. They could be lucky on some days.

That's not to say I haven't traded these things. I do it.

**JA:** I was going to ask you if you've used any of these products.

**RW:** Sure. Absolutely. But I think I know what I'm doing.

**JA:** If anyone does, it should be you.

**RW:** When I'm not teaching, I keep the news on in the background, so I know what's going on. And I know the

effect it might have on volatility, or I know the effect it might have on crude oil prices. But I'm day trading. People hold these things for multiple days. And they don't know what they're doing.

**JA:** It seems like there's plenty to fear these days. Is there anything in particular that worries you?

**RW:** The VIX itself gives me assurance from day to day. What I do, given that the markets trade overnight, I look at the VIX futures before markets open here. And I'm comforted by the fact that smart institutional money, the people trading VIX futures, is telling me the price of insurance a month from now is going to be considerably less than it is now. The people setting the prices of those VIX futures contracts are telling me that, in their best judgment, things are going to get better. And that gives me a good deal of assurance, to be quite frank.

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